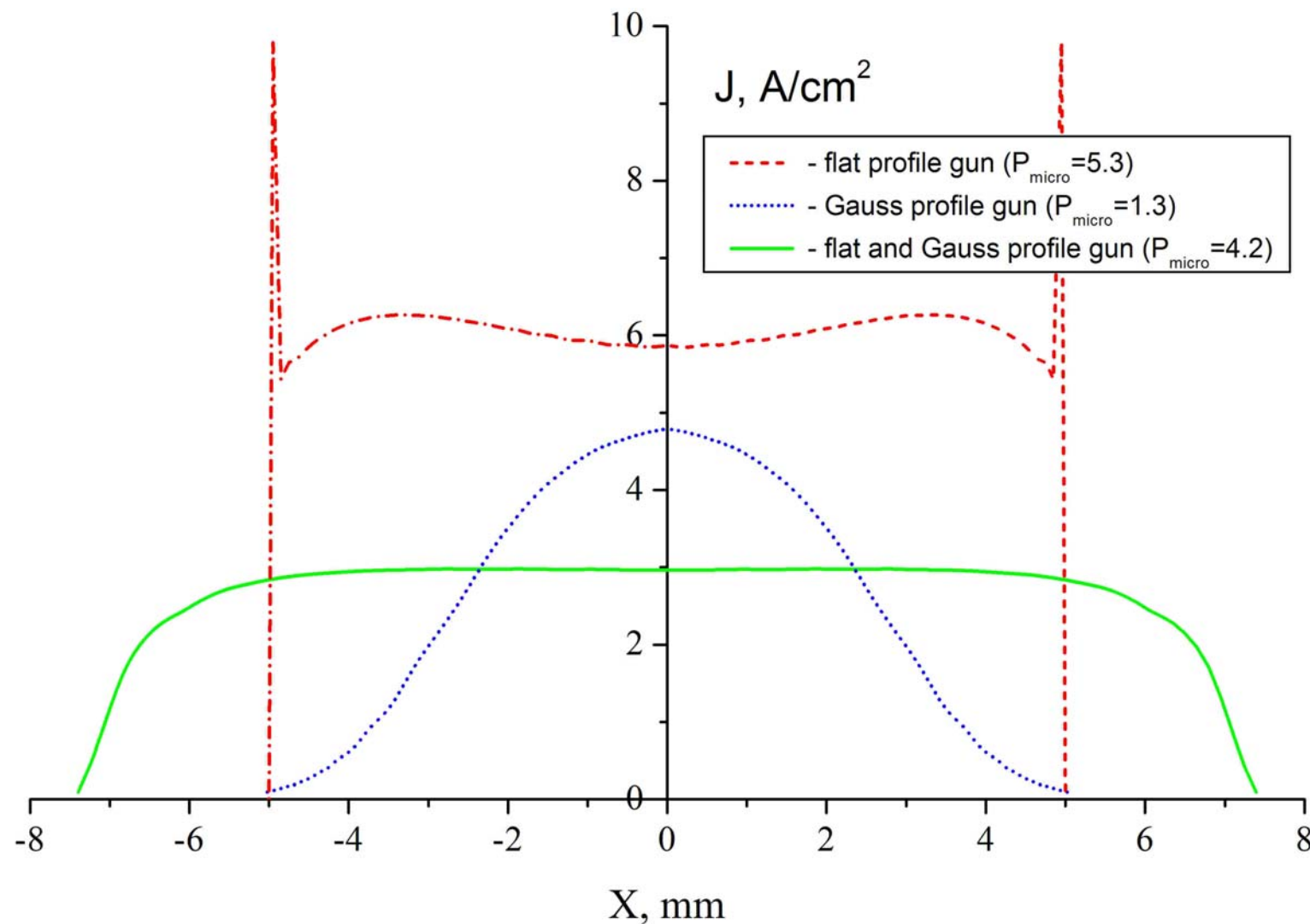


# Recent Beam-Beam Compensation Studies and General Plan

Vladimir Shiltsev for BBC team  
Fermilab



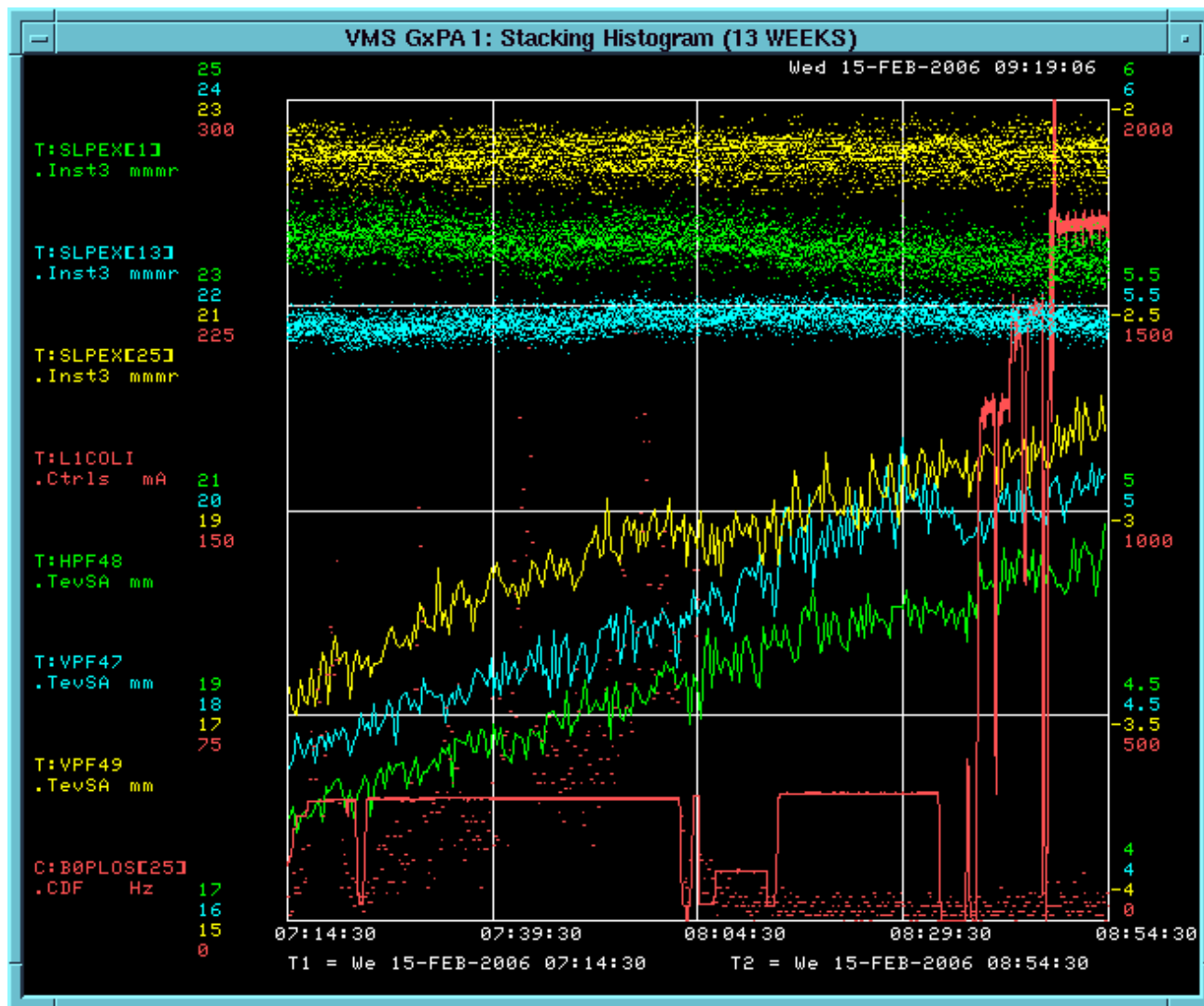
# Three e-beam current profiles



- 2001
- 2003
- 2005



# Lifetime and Emittance growth with TEL

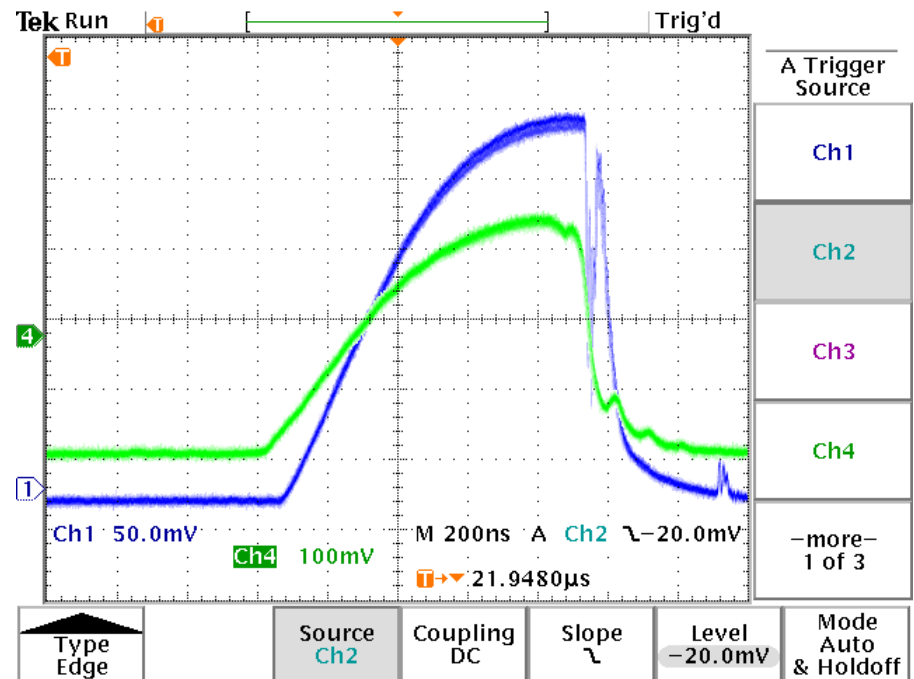
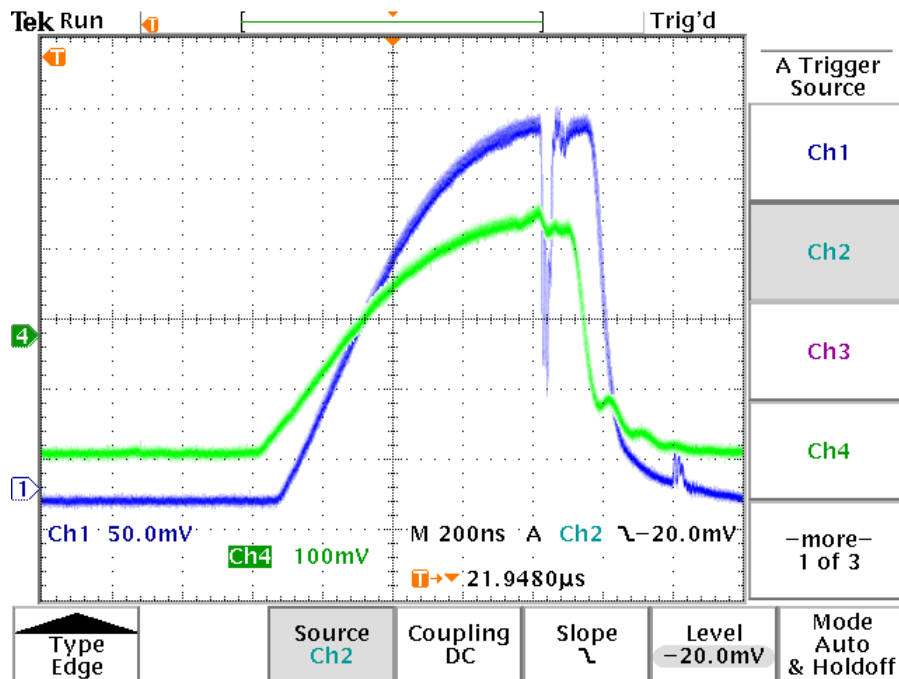


# Summary studies:

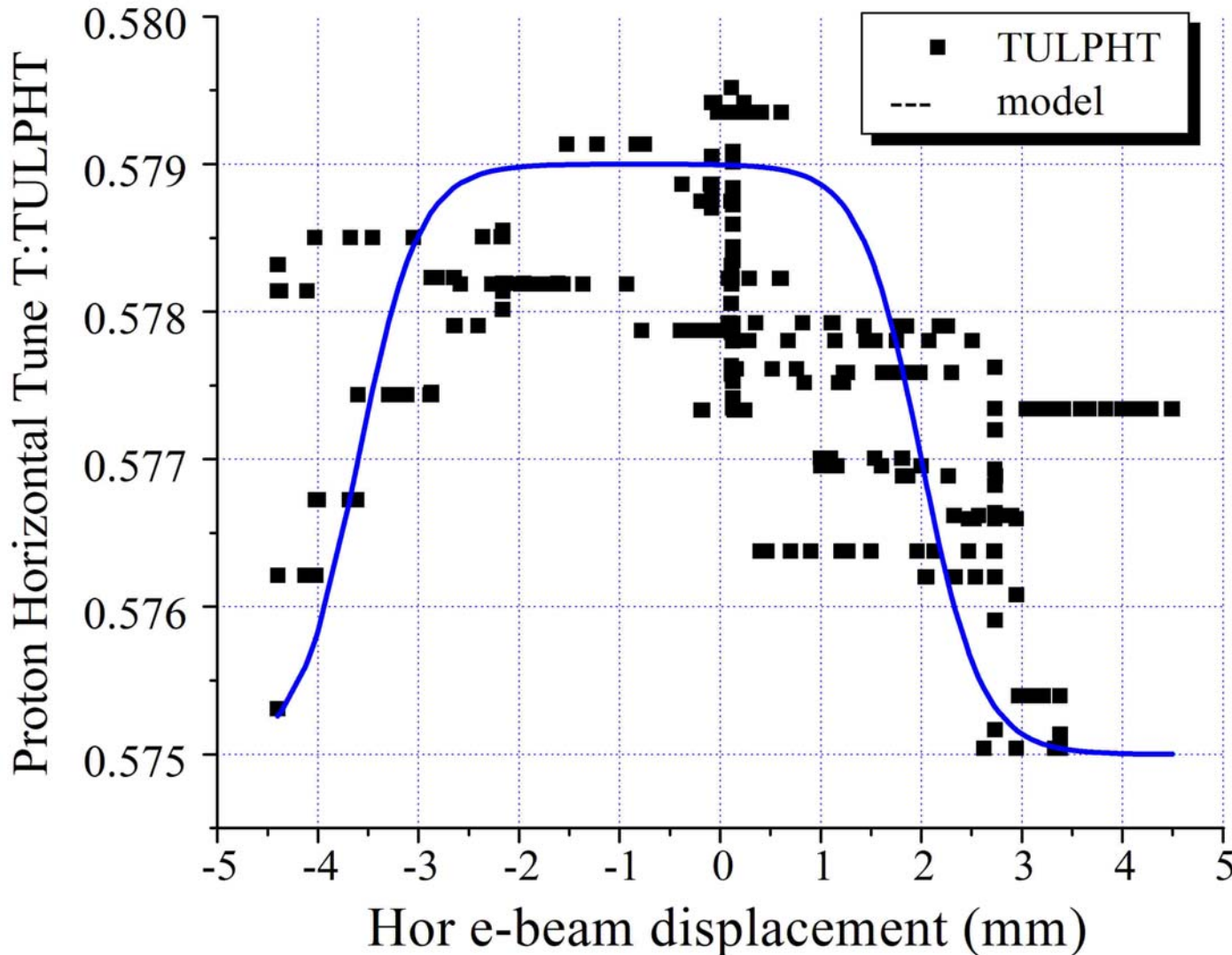
- With new SEFT (smooth edge flat top) gun
- Lifetime time is
- as good as 700 hrs in DC beam regime
- and 340 hrs in pulsed regime
- No significant difference found between DC pulsed and no-beam regime
- Except some moments when we move/turn TEL pulse Off



# Timing jitter matters on the slopes



# Tev Tune vs e-beam position



Feb 17<sup>th</sup>, 2006  
beam study  
EoS 1x1 store  
40 pi emittances

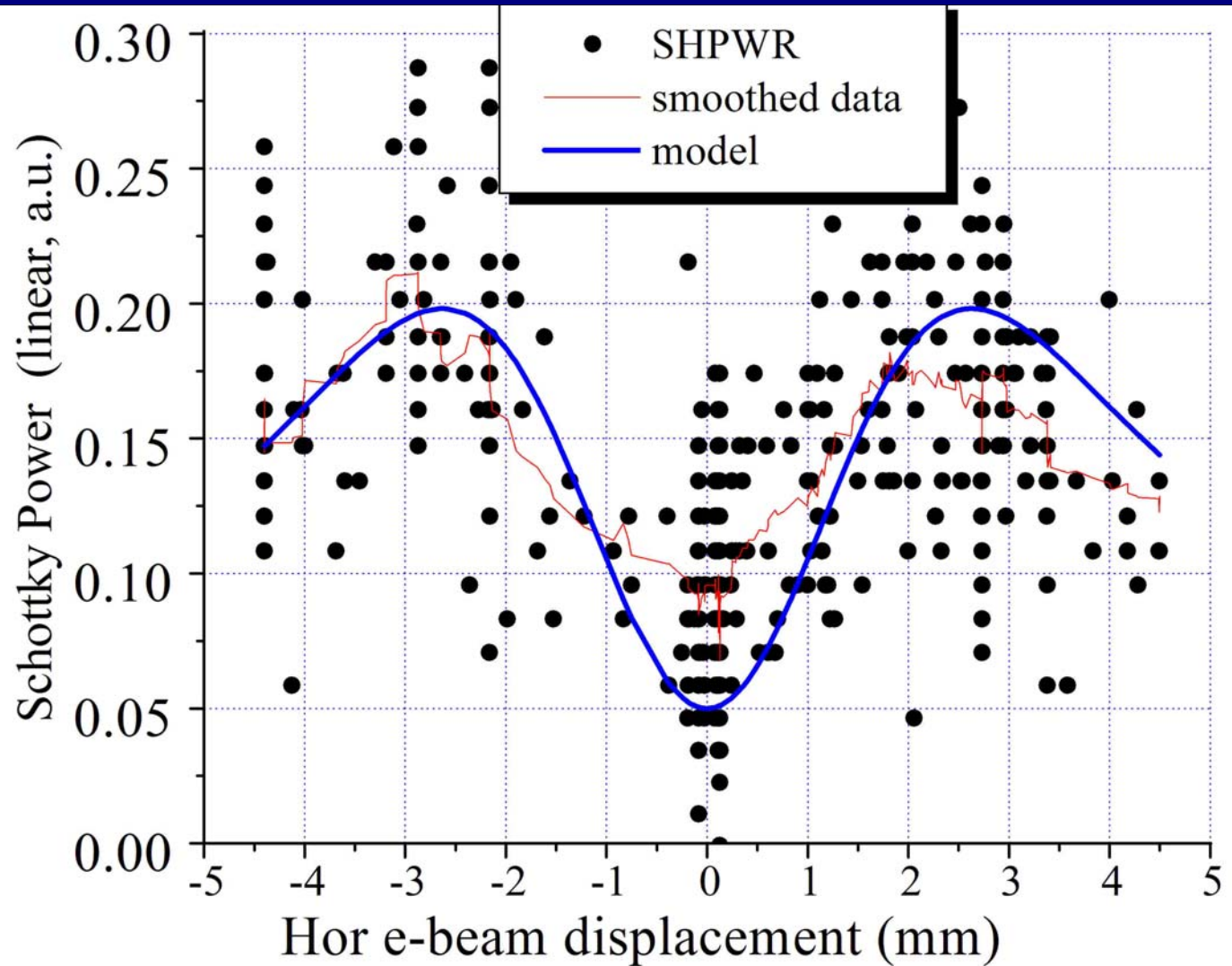
1.7 GHz Schottky  
tunes

Hard to see anything  
in 21MHz Schottky  
spectra  
Unless de-centered or  
mistimed



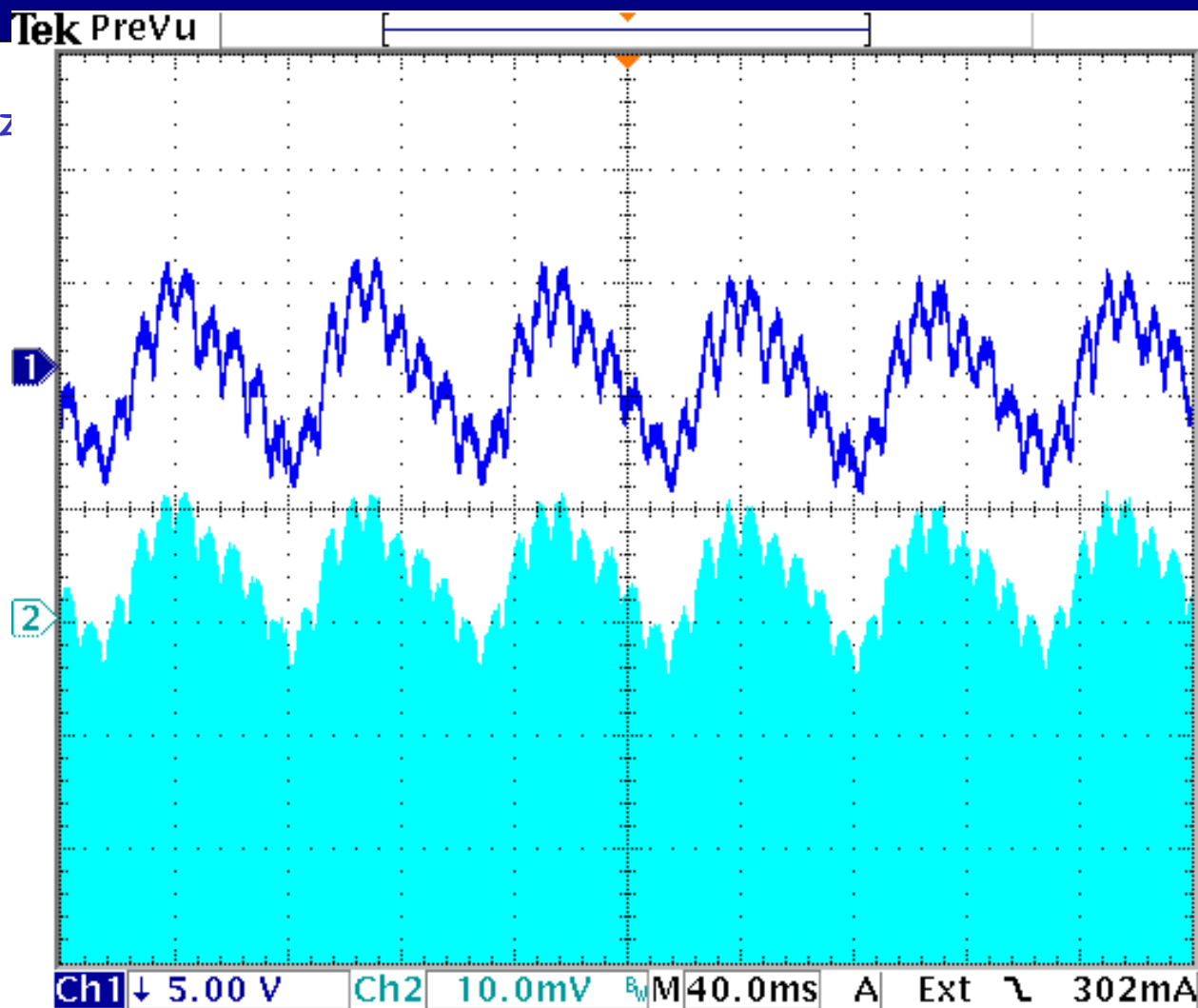
# 21 MHz Schottky power vs e-beam

Feb 17<sup>th</sup>, 2006  
beam study  
EoS 1x1 store  
40 pi emittances



# TEL current ripple

- 15 Hz and 120 Hz
- About 1-2%



17 Feb 2006  
17:00:37





# Further experimental work:

- Finish TEL-2 BPM data processing and conclude on new BPM/algorithm quality
- Get rid of 15-120 Hz ripple; figure why we blow up beam when turning OFF, monitor J\_peak
- In-store study
- Generate combined BBC+cleaning pulse structure
- Build spare SEFT e-guns - with modified HV feedthru?
- Explore possibility of grid:
  - will be perfect for cleaning (i.e. in one of TELs)
  - sheering of grid shadow in the TEL
- Conclude MARX generator development
- Better single bunch tune measurement/Schottky power measurement:
  - 1.7GHz Schottky
  - Schottky III (J.P.C and Alex Semenov) -for centering



# Shutdown work:

- Install two bypasses at A1 (3<sup>rd</sup>-8<sup>th</sup> week)
- Install TEL-2 (5<sup>th</sup>-6<sup>th</sup> week)
- Pull ~12 heliax cables (any time)
- Install shielding (at the end)
- Pump, leak check, bake (1 week)
- Commission hardware and PSs (1 week)
- Commission with beam:
  - for cleaning (as spare)
  - For BBC:
    - First - alone
    - Then - together with TEL-1



# Simulations/Tracking Needs:

- Effect of low-frequency variations  $dJ$ ,  $dX$  @ 15 Hz, 60Hz, 120 Hz, etc on beam lifetime
- Importance of  $e$ - $\bar{p}$ ( $p$ ) interaction in bending section
- Grid shadow (sheered) effect
- Lifetime deterioration due to  $e$ - $\bar{p}$ ( $p$ ) misalignment: position, angle
- Head-on compensation with Gaussian  $e$ -beam : dependence on  $\beta_{TEL}$  vs  $\beta^*$
- Cross-interaction with wires in LHC - ?



# Overall Plan:

- Have two TELs commissioned and employed for compensation of *some* beam-beam effects (emittance or lifetime? Pbars or Protons? Parasitic or head-on? 980 or 150 GeV? -  
in 2007-2009
- Perform simulations and convince that TEL can be tested at RHIC 2007-2009
- Install TEL(1? 2?) in RHIC and demonstrate head-on compensation - 2009-2010
- Install and employ at LHC - 2011-2012

